FIBRE4YARDS
SHIPYARD FOR THE FUTURE

FIBRE4YARDS

FIBRE composite manufacturing technologies FOR the automation and modular construction in shipYARDS

Project public presentation

April 2021

This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement n° 101006860.

FIBRE4YARDS
SHIPYARD FOR THE FUTURE

13 PARTNERS

7.6M€ BUDGET

6 EUROPEAN COUNTRIES

5.9M€ EU CONTRIBUTION

36 MONTHS

995 PERS/MONTH

TO DEVELOP FIBRE COMPOSITE MANUFACTURING TECHNOLOGIES FOR AUTOMATION AND MODULAR CONSTRUCTION IN SHIPYARDS

Background

Today, Fibre-Reinforced Polymers (FRP) materials are extensively used for building lightweight hull structures of vessels with length up to about 25 m. FRP are also used for even larger lengths (up to 50 m). In fact, most of the leisure craft and sailing yachts, naval ships, patrol and rescue vessels below 25 m length are built in FRP materials.

However, the production capacity in numbers of FRP ships does not achieve its full potential due to high total production costs. One of the main reasons for this limitation is the lack of automated procedures, and the current semi-artisanal methods used in FRP shipbuilding.

https://www.boats.com/on-the-water/boat-building-construction-resin-fiberglass-cores/

Objectives

The main objective of FIBRE4YARDS is to maintain European global leadership in ship building and ship maintenance, through the implementation of the Shipyard 4.0 concept in which advanced and innovative FRP manufacturing technologies are successfully introduced.
FIBRE4YARDS will implement a cost-efficient, digitized, automated and modular vessel production approach.

Objectives

FIBRE4YARDS focuses on the entire value chain (shipyards and their ecosystem) cooperatively working on small and medium length fibre-based ships in a digital environment.

The main objective of the project will be achieved by:

1. Introducing smart and secure engineering, manufacturing and data sharing concepts in ship production.

2. Embedding advanced and highly automated FRP production technologies in the Shipyard 4.0 while applying these technologies in ship production, maintenance and dismantling.

Objectives

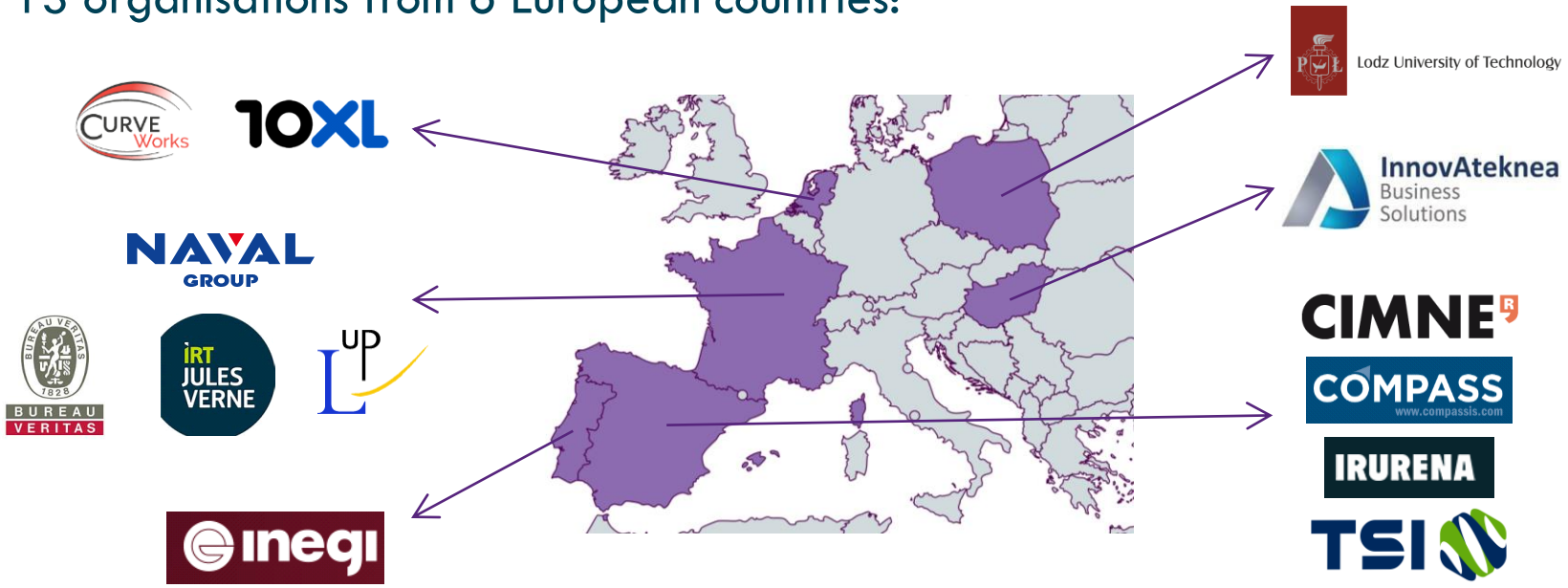
3. Developing and validating new (digitalized) engineering and analysis simulation solutions to support modular ship design and construction in the Shipyard 4.0 concept.

4. Facilitating industrial deployment of the FRP Shipyard 4.0 by providing guidelines for design, production, certification, and staff training.

5. Developing business plans and Intellectual Property Rights (IPR) strategies for shipyards.

Consortium

13 organisations from 6 European countries:



Consortium

4 Research Institutes: CIMNE, inegi, IRT Jules Verne, Lodz University of Technology

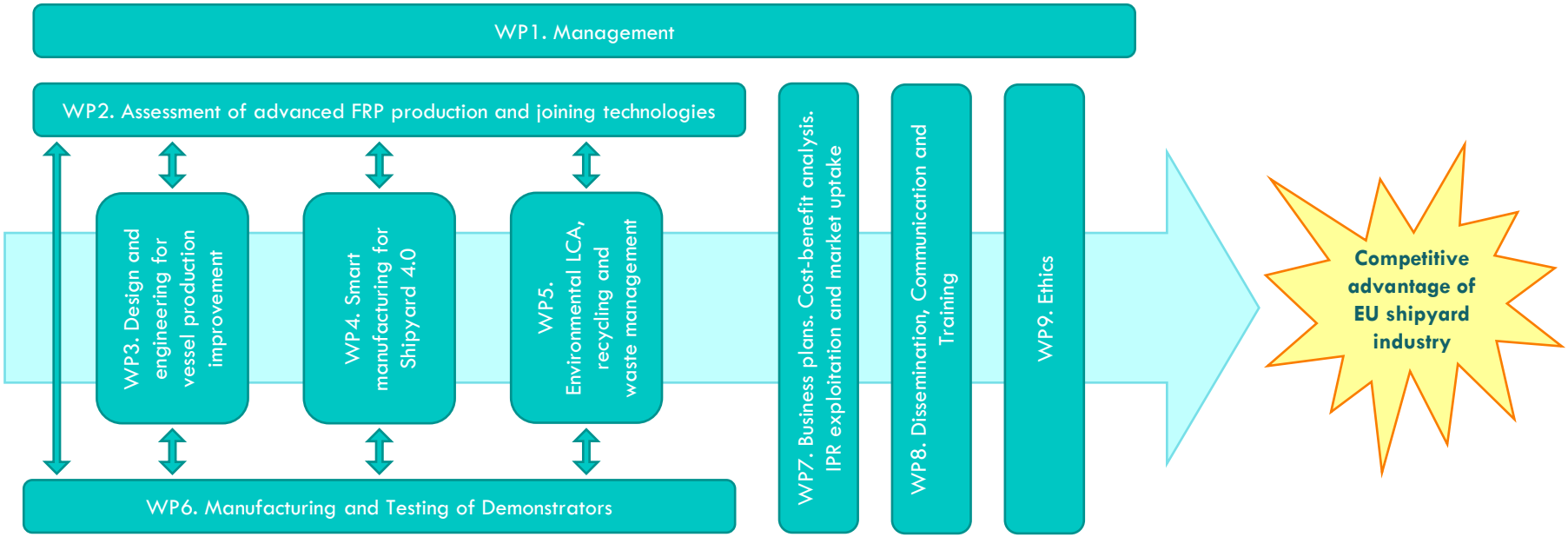
7 SMEs: COMPASS www.compassis.com, TSI, IRURENA, UP, CURVE Works, 10XL, InnovAteknea Business Solutions

1 Industrial Company: NAVAL GROUP

1 Classification Society: BUREAU VERITAS

Workplan

The project objectives will be achieved through the following workpackages:



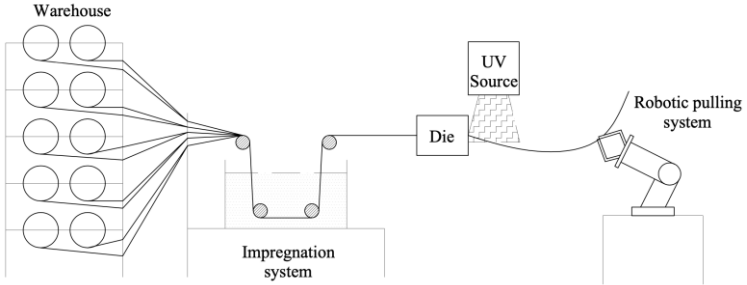
Advanced FRP production and joining technologies

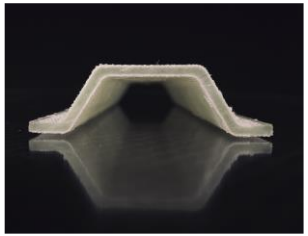
FIBRE4YARDS will:

- Develop new FRP production technologies
- And look into advanced production processes already used in other industries (aeronautics, wind, etc.) to adapt them to the marine sector

The targeted technologies are:

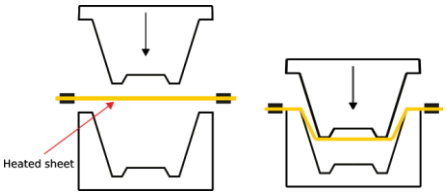
Out of die UV cured pultrusion for manufacturing curved profiles (IRURENA)





Advanced FRP production and joining technologies

Hot stamping of thermoplastic materials (INEGI)



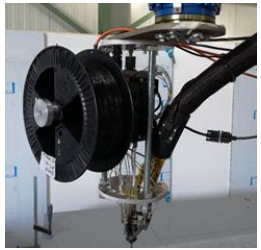
Automatic Tape Placement (ATP)/Automatic Fibre Placement (AFP) (10XL)

https://www.tss.trelleborg.com/en/products-and-solutions/advanced-composites/automation-equipment/fiber-placement

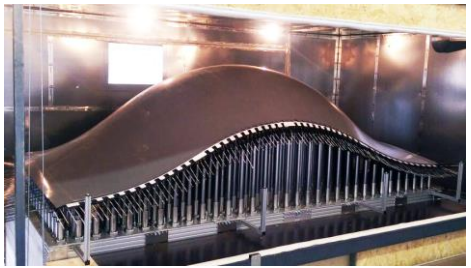
https://www.compositesworld.com/articles/automating-wind-blade-manufacture

Advanced FRP production and joining technologies

Additive manufacturing: 3D printing (10XL)

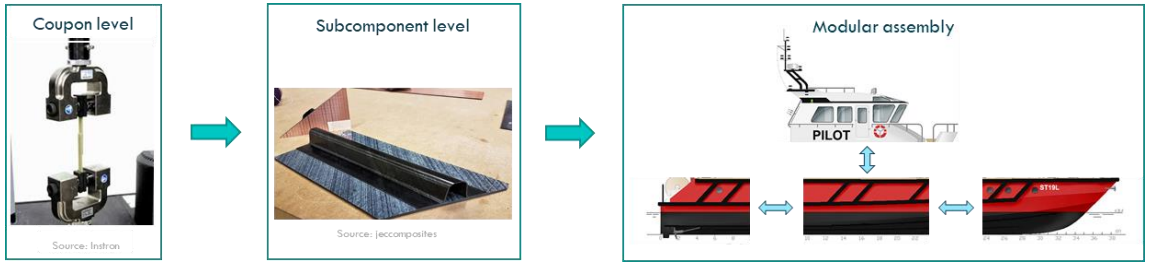


Adaptive moulds for composite panel assemblies (CURVED WORKS)

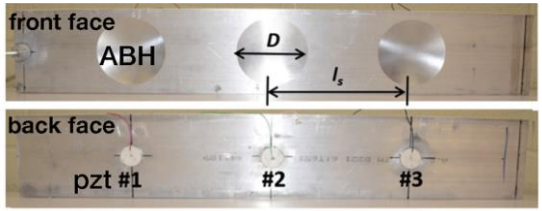


Advanced FRP production and joining technologies

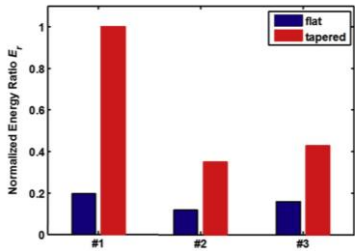
Connection Techniques (INEGI)



Acoustic damping by using "acoustic black holes" (IRT JULES VERNE)

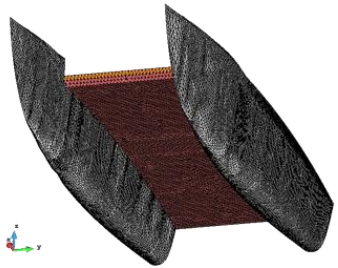


https://doi.org/10.1016/j.jsv.2020.115316



Design and engineering for vessel production improvement

FIBRE4YARDS will design two ships, optimized by means of the developed production methods, and enabled to be produced in a Shipyard 4.0 environment.



The numerical software will contain the formulations developed to predict the performance of composite structures manufactured with the advanced technologies investigated in the project.

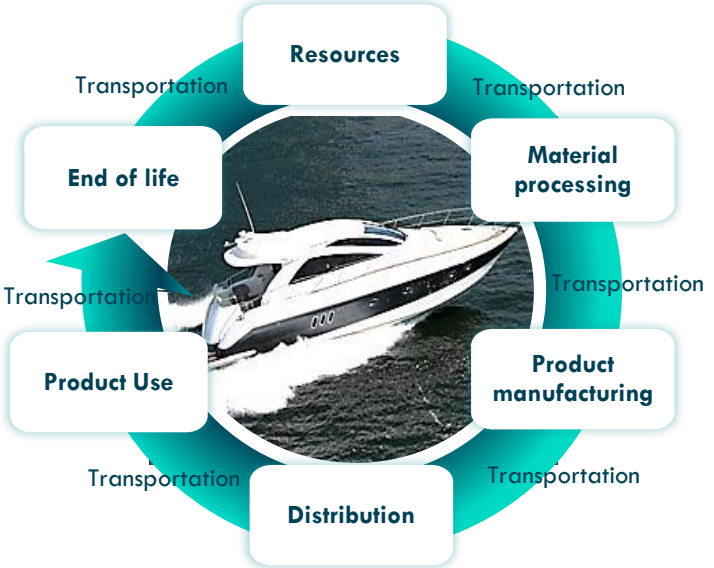
Smart manufacturing for Shipyard 4.0

In order to define a new generation of 4.0 shipyards, FIBRE4YARDS will:

- Develop monitoring strategies to obtain required data for continuous quality control and factory maintenance
- Develop a Digital Twin Model of the shipyard which, based on the continuous monitoring and the Internet of Things (IoT), will control the different production and maintenance processes
- Define applications of smart technology based on the IoT to shipbuilding to develop the Shipyard 4.0 concept and improve production and maintenance processes
- Define cyber-security measures in the Shipyard 4.0

Life Cycle Assessment

- FIBRE4YARDS will conduct a Life Cycle Assessment (LCA) analysis of different advanced FRP production and joining technologies to assess their environmental impacts over the entire life cycle of ships
- LCA analysis will be performed according to ISO 14040/14044 standards and based on environmental models such as ReCiPe 2016, IPCC 2013, etc.
- Results of the LCA analysis will indicate which technology has the lowest environmental impact over the entire life cycle



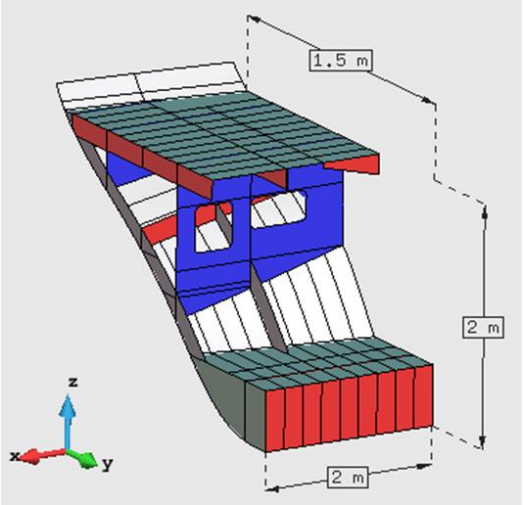
Manufacturing and testing of demonstrators

All developments made in FIBRE4YARDS will be evaluated with the construction of two demonstrators:

- First demonstrator will contain elements produced with each of the production technologies developed.

  It will be designed with the numerical tools developed in the project.

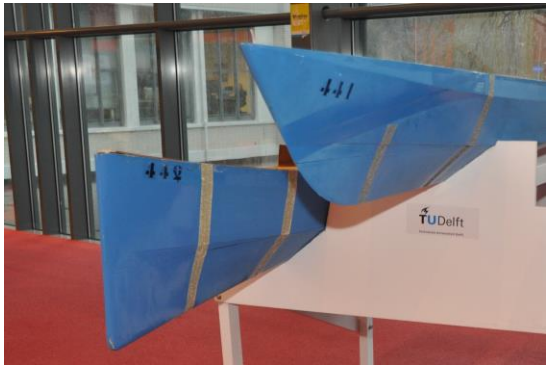
  The construction of the demonstrator will also help to evaluate the performance of the Shipyard 4.0 elements developed in FIBRE4YARDS.



Manufacturing and testing of demonstrators

- Second demonstration will be a 3D printed axe-bow.

  This demonstrator will be also used to evaluate the performance of the IoT and the Shipyard 4.0 elements implemented during the project.



Project impacts

1. **Competitiveness and growth for small and medium shipyards**
   Implementation of Shipyard 4.0 will increase the competiveness of European shipyards

2. **Employment and skills of European workforce**
   Advanced manufacturing procedures will solicit workforce with improved skills

3. **Improved environmental performance**
   FRP ships manufactured with advanced production procedures will use less material more efficiently, reducing significantly the ship's weight. A Life Cycle Analysis (LCA) will accompany this change

4. **Multiplication effect within Europe**
   Developments made towards Shipyard 4.0 will be easily adapted to other shipyards besides the ones directly involved in the project, spreading the results easily

5. **Maximise EU added value by minimizing technology leakage**
   Business plans and protection strategies for the IPR generated in the project will be developed

Summary

FIBRE4YARDS is bringing together a consortium with the expertise and the willing to improve the productivity of the European shipyards.

This will be achieved by implementing automatized production methods that will allow a modular construction of the ship, within a new redefined Shipyard 4.0 environment.

New developments will take into account the ship's LCA, and the new ships will be redesigned to adapt them to the new production technologies.

Finally, FIBRE4YARDS will develop a business plan to maximize the impacts of the project.

FIBRE4YARDS
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https://www.fibre4yards.eu/

https://www.linkedin.com/company/fibre4yards/

If not acknowledged, images courtesy of the consortium partners.

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